CHAPTER 6

TRAILS

6-1. Foot Trail.

a. Application. The purposes for providing trails in recreation areas are for visitor's enjoyment, education, and excercise. In addition, trails may also support fire control and special administrative access. The needs of the elderly, the very young, and the physically and mentally handicapped must be considered early. Their need for outdoor experiences may be even greater than that of other visitors. Often minor modifications in existing trails, and more sensitive design of new ones, can provide handicapped persons with a joyful and memorable experience instead of one that is frustrating and/or hazardous. Trails may be designed with one or many disabilities in mind. Special trails for the visually and physically impaired should not conflict with other trail users. They should be designed to permit an interchange of trail experience with other users. It is difficult to design a trail for both the blind and the wheelchair user. Wheelchairs bog down or slip on trail surfaces such as pine needles or gravel which are often a tactile delight to the blind.

b. Controls. Flexible design standards should be applied to the various types of foot trails. A careful analysis is required of each type describing volume of use, kinds of users, mood desired, guided or self-guided, seasonal or time-of-day restrictions, and limitations needed because of topography or administrative constraints.

c. Design Considerations.

(1) Surface.

(a) Natural. Where terrain permits, the surface of most hiking trails should receive little improvement except for that made naturally by those walking on it. Some steep slopes may require grading and/or water barriers (bars). Any areas where the existing surface is unsatisfactory the unsuitable surface should be excavated and the trail surfaced with wood chips, gravel, sands, slag, or other aggregates less than one inch in diameter. Depth of fill may vary up to six inches according to the soil and its trafficability. A soil sterilant might be needed to control difficult to maintain vegetative species, such as poison ivy and briered plants on some tread surfaces. Some areas which receive especially heavy traffic may need to be paved.

(b) Surfaces for special use. Surfaces of trails to be usable by the handicapped need special treatment. Where possible, trails for the

Figure 6-1 Scenic trail with paved surface

blind should have a natural surface such as pine needles, gravel or wood chips. All trails for the blind (whether natural or paved surface) should have a contrasting surface material at its edges to indicate the edge to the blind user. The contrasting color of the trend surface and edging will aid the partially blind. Generally, a concrete trail with turf edges or an asphalt trail with a light colored gravel edge will serve both purposes. All trail surfaces designed for the wheelchair user should be paved with non-slip brushed concrete or asphalt. Expansion joints should be minimized as well as expansion joint filler which extends above the surface. The best paving material is sealed asphalt since there are no expansion joints to worry about. Very hard asphalt should be used to prevent wheelchair wheels or crutches from sinking in during hot weather. A solid surface extending 1 foot beyond each side of the trail should provide lateral support as well as the contrasting strip needed by the blind and partially blind. Figures 6-1 and 6-2 show a scenic trail with paved and unpaved surfaces.

(2) Drainage. Drainage must be considered with all trail types. Drainage is one of the most important items in trail construction and is often the most neglected. A study of the precipitation and runoff characteristics as well as the soil characteristics of a locality should be made to properly determine the methods best suited for disposing of drainage water. The problem can often be solved by diverting water from the trail at suitable intervals before it builds up an erosive force. Methods used are described below:

(a) Outslope. The tread is sloped 2 to 4 percent to the downhill side.

Figure 6-2 Scenic trail with unpaved surface

(b) Grade dips. Sections of trail where a shorter segment (not over 5 feet to 6 feet) has been built with a grade slightly adverse to the prevailing trail grade.

(c) Water bars. Water bars can be made with 6 inches to 8 inches diameter peeled log or timber laid at a 30 to 45 degree angle to the trail and fastened to heavy stakes, posts, or steel pins. The grade above the water bar should be flush with the top of the water bar. Figure 6-3 shows water bars in place for protection of the trail surface. Immediately above the water bar, the outer edge of the trail should be sloped downward to permit water release. A combination of the above methods usually provides the best drainage and is preferred to culverts and bridges. In extreme cases drainage ditches, culverts, and catch basins may be needed, but care should be taken in then selection to blend into the surroundings. In addition, some grate patterns can be hazardous to persons using crutches, canes or wheelchairs.

(3) Gradient. The rate of grade should not be steeper than 15 percent with 6 percent considered a general grade. Short sections of the trail may have steps and grades exceeding 15 percent. See the Manual on Design for the Physically Handicapped gradients for handicapped users.

Figure 6-3 Water Bars

(4) Length and alignment. The trail length may vary depending on its use and purpose. It may be short, perhaps 1/2 mile, or it may extend for many miles and incorporate both urban and rural characteristics. There are two basic types of trail alignment (a) simple one-way loops with common start and finish points and (b) linear trails along parkways, rivers, etc., which require hikers to make transportation arrangements at the end of the trail. Trails made accessable to physically handicapped should provide flat areas for resting (turnouts) at 100 foot intervals along the steeper lengths of the trail. Trails for the handicapped should be 1/10 of a mile to 1 mile long. The trails should avoid an excessive number of sharp turns or right angles.

(5) Width. Some variation according to the flora and terrain is appropriate. As a general guide, the trail should be sufficiently wide that the route will be clearly obvious as one looks along the trail. A long distance back country trail should have an actual width of around 24 inches. Figure 6-2 illustrates a back country trail. Where an existing route, such as an old logging road is incorporated into a trail the width may vary. The width for shorter trails, such as those confined to campgrounds should be from 3 to 5 feet. The three foot width would be suitable for one-way loop trails. Heavily used trails and those which may be used periodically for maintenance and emergency vehicles should be a minimum of 8 feet.

(6) Clearance. Clear trees, brush, rocks and ground litter only to a sufficient width and height to provide an unobstructed passage for

hikers and backpackers. Excessive clearing is not desired. The clearing height on hiking trails should be not greater than 8 feet. Horizontal clearance should be a maximum of 2 feet on both sides of the trail.

(7) Maintenance. All trails will require occasional maintenance work to keep them in good condition. Care should be taken during the design of a trail to insure that maintenance costs will be as low as possible. Clearing should be done on an annual basis to keep the trails clear of briars, tree sprouts and other undesirable growth. Late spring or early summer is the best time for this type of maintenance as winter blowdowns can also be removed. To discourage the use of shortcuts across graded switchbacks, rocks, logs, or other physical barriers may be placed in the shortcut. Excess soil from initial construction should be stockpiled at appropriate locations (out of sight) for possible future maintenance requirements.

(8) Signs. Signs should be kept to a minimum, but the trail should be adequately marked to warn, restrict, or inform the using public. The trail name should be prominently displayed at the entrance. Signs should be low profile and compatible with surrounding landscape. Standard wooden and metal materials can be used; most metal types will be more resistant to vandalism than wood. Vandalism will be the most severe in the first 500 feet of the trail, the more expensive displays and signs should be located beyond that zone, if possible. Care should be taken in the placement of all directional and interpretive signs. The lower eye level (approx. 45 inches) of wheelchair visitors should be considered. Signs for the blind can be made with routed or raised letters or with braille. Actually a combination of the two is preferred. Many of the partially blind can read bold print (letters 18 pt. or larger-3/16 inch). Experts in education of the blind and the physically handicapped should be consulted.

(9) Safety. All standard precautions must be taken. Bridges and steep steps should have handrails; fences or some type of barrier should be placed along bluff edges. Visitors should be adequately warned of hazards that may exist such as - poison ivy, poisonous snakes, falling rock, adverse weather conditions, wild animals, etc. Hikers should be especially aware of the dangers of forest fires and the safety precautions that must be taken with campfires. During periods of extremely high fire danger, trails may have to be closed and provision for closure should be part of the design. Wherever possible, topography should be fairly level for 3 or 4 feet on the downhill side of trails as a safety factor for to wheelchair users. In places where this is not possible or in places potentially dangerous to the handicapped, curbing 4

inches high should be installed. Guardrails or handrails 32 inches off the ground may be substituted for curbing. Handrails should be provided on at least one side of all ramps, bridges and steps. Manholes, and drain inlet grates should be kept off all trails. But, if grating cannot be avoided, the openings in the grates should not exceed one half inch. Methods have been developed to guide the blind such as cord strung along one side of the trail with, knots or markers on the cord to identify the location of displays and signs, and kickboards set along the edge of the trail surface. The kickrails can enable the blind to follow the trail through simple shoe contact with the rail. These methods can alternate from side to side depending upon location of interpretive markers. A simple 3 inch wide, white line painted on the trail surface can enable the partially blind to follow a trail safely. Facilities should be available for emergencies that might occur on the trail and routes should be laid out for emergency vehicles to reach the trail. Figure 6-4 shows details for providing guidance to the blind on trails. Special attention should be given to trail crossings at park roads. Caution signs along the trail and road should be made part of the design.

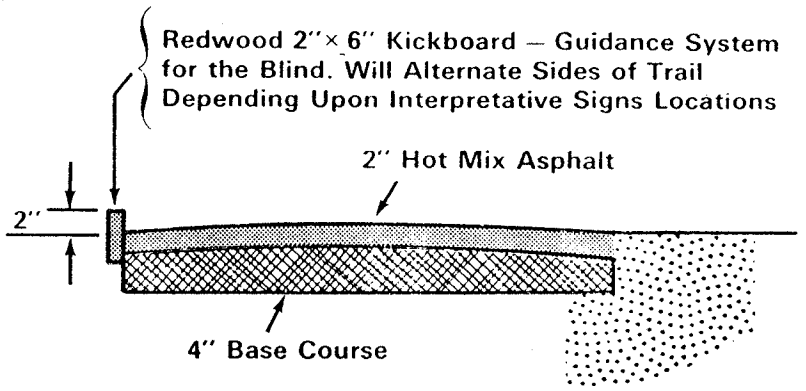
(10) Support facilities.

(a) Sanitary. Heavily used trails may require toilet facilities. When required, they are usually best located adjacent to a trail entrance and/or parking area. Trash receptacles should also be provided near the entrance and parking area. When trash receptacles are not provided on the trail, appropriate signs should be posted at the entrance.

(b) Primitive camping. Primitive camping areas should only be provided on long distance cross-country trails. Generally, backpackers are most interested in minimal development of campsites. Such facilities can include a drilled well with hand pump, a fire ring, a picnic table, and a pit toilet. The camping areas should be small, with space cleared to accommodate no more than ten tents.

(c) Potable water. It is not essential to provide water on shorter trails, but it would be an appreciated facility, especially at the trail's end. Potable water should always be available, at least at the beginning and end, on longer trails. A well or spring 5 gpm unfailing water supply is satisfactory for hiking trail use. Design potable water facilities in accordance with state public health standards.

(d) Parking area. Ample vehicle parking should be provide at trail head and ending. If natural barriers do not exist, posts, boulders, or some other physical barriers should be used to restrain vehicles from entering hiking trails.



Cross Section
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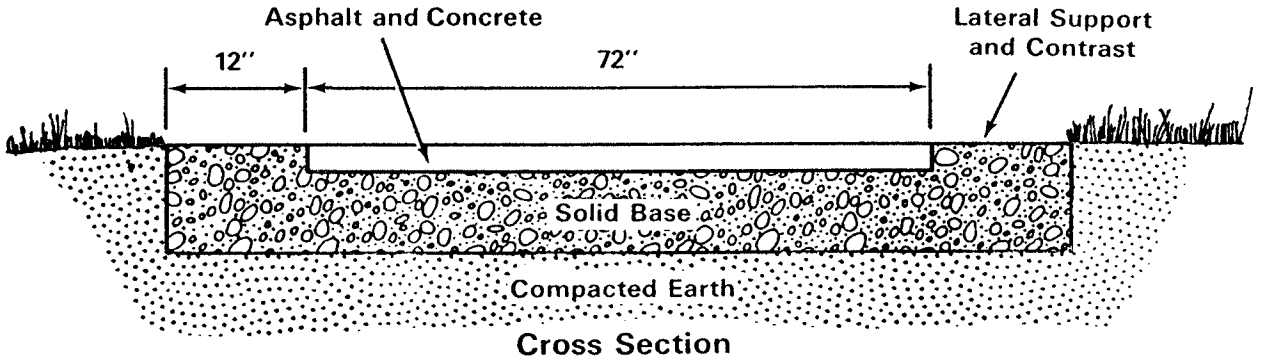

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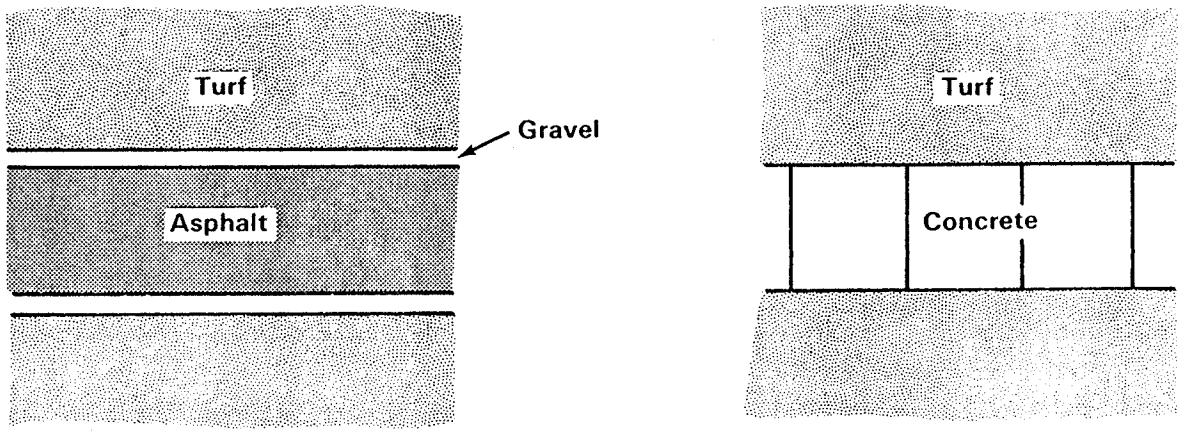

Alternate Surfaces
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Figure 6-4 Methods of providing guidance to the blind

6-2. Bike Trails.

a. Application. Bicycle trails can be made part of a multipurpose trail near urban areas. Where possible, an effort should be made to tie into existing metropolitan trails. In larger, busier parks the biker's safety may justify a separate trail system.

b. Controls. Volume of use, average age of users, safety, separation of bicycles and autos, speed, and seasonal limitations control the design of bike trails. Type of equipment and specialized users (handicapped) also need to be kept in mind when designing bike trails.

c. Design Considerations.

(1) Surface. A paved surface is essential. It is a common misconception that bike trail surfaces do not require heavy load-carrying capabilities. Actually, bicycles have a highly concentrated weight in a very small area and thus the load capacity of the surface should be comparable to that of an automobile. The surface should also be capable of supporting light maintenance vehicles. A bituminous surface is the most popular with bikers because of the smooth ride it provides. Proper attention must be given to the subbase for bicycle trails for good drainage and support for the pavement. The surface thickness can vary depending upon soil stability and material availability. The accepted standard is 2 inches of bituminous over a 4-inch aggregate base with a

Figure 6-5 Bicycle Trail

compacted subgrade. Where good soil drainage exists the base can be stabilized earth, soil cement, or aggregate. Full depth asphalt can be used instead of aggregate, with a 3 to 6-inch thickness depending on the quality of the subgrade. Roadway mix can be used provided it is dense graded. Concrete is an alternative surfacing to bituminous. For a bike-path there should be a 4 inch concrete surface over a 4 inch aggregate base. Though this surface is the most durable it also has some disadvantages: (a) it is expensive, and (b) there is some riding discomfort due to expansion joints.

(2) Drainage. To provide proper runoff of excess water, the crown of the surface should slope 0.02 foot to 0.03 foot per foot. In addition to drainage ditches, culverts may be needed for cross drainage. In extreme cases catch basins may be needed. Positive drainage of the subgrade of the area prepared for the base course is also essential to good design.

(3) Gradient. Bicycle trails should follow the natural contour wherever possible. Weather conditions, physical energy, and bicycle characteristics are factors which can limit the slope and number of grades used. Under ideal conditions the maximum gradient for a long (1500 feet) uphill slope should not exceed 2 percent. For short segments (less than 300 feet) 5 percent can be negotiated. Gradients are no problem to experienced bikers. The design of bike trails should not, however, be influenced by the experienced bikers abilities only. The occasional biker should also be considered.

(4) Length and alignment. It is difficult to establish a precise minimum or maximum length because this is dependent upon many factors. Short recreational loops range from 3 to 10 miles. Touring trails can be much longer. A bike trail should blend into the environment. Taking advantage of the topographic features of an area will provide a diversity of scenery and riding experiences. Figure 6-5 shows an example of a bicycle trail, while figure 6-6 shows a multipurpose trail.

(5) Width. With ideal shoulder conditions, a standard width of 4 feet for one-way and 8-feet for two-way traffic is acceptable. A 2-foot shoulder on both sides is ideal. Pavement spreaders can spread a minimum 8-foot section and is the most cost effective method of surfacing when an 8-foot path or near that width is required.

(6) Clearance. Bike trails should have a horizontal clearance of 2 feet beyond pavement or improved shoulder and a vertical clearance of 9 feet.

(7) Stopping sight distance. For safe operation, the bike trail should have a minimum sight distance for safe stopping. Design values for safe stopping sight distance may be computed using the same

Figure 6-6 Multi-purpose trail

methodology as is used for roadways. Table 6-1 is based on a coefficient of skid resistence of 0.25 (based on a bike with good brakes and a single wheel in contact with a paved surface) and a perception-reaction time of 2.5 seconds.

Table 6-1 Stopping Sight Distances for Downhill Gradients

Design Speed	0%	5%	10%	15%
10 mph	50 feet	50 feet	60 feet	70 feet
15	85	90	100	130
20	130	140	160	200
25	175	200	230	300
30	230	260	310	400

(8) Curvature. Within the aforementioned criteria for designing park trails, minimum radii for curvature should be incorporated into the design. If this is not possible, adequate signing and marking should be used to indicate the sharp curve ahead. Some superelevation should be included in the design for all curves, however little information is available as to what the rate should be. A general design value of .05 has been used. Table 6-2 considers a curve where little or no superelevation is used, therefore where more than token superelevation is provided the radii may be reduced.

Table 6-2 Design Radii

Design Speed mph	10	15	20	25	30
Design Radius feet	15	35	70	90	125

(9) Design speed. Design speed should be considered in the layout for bike trails even in parks. The goal in parks is not to reduce travel time but to insure safe and enjoyable operation. Most bicycle riders travel at speeds of 7-15 mph with 10 mph as typical. On an interesting or scenic segment of a trail the speeds will probably be slower. On moderate or steeper slopes design speed becomes an important consideration. Speeds can easily build up to 15 mph on moderate slopes while speeds of 20 mph and higher should be considered for long moderate slopes or steep slopes. Bicyclists should be reminded of possible hazards ahead as well as the scenery. Many objects, such as tree branches, turtles, and slick leaves can present hazards to the biker.

(10) Maintenance. Ease of maintenance of the bicycle trail is a critical consideration. Pavement protection from erosion is important in the design of bike trails.

(11) Signs. Signs on bikeways are needed for three purposes: (a) regulating bike movement, (b) warning bicyclists of potential hazards, and (c) providing direction and information. Directional signs are especially important where trails cross or follow existing roadways for short segments. The standard bicycle symbol should be used for marking and distinguishing the trail location. Standard metal and wooden materials can be used; most metal types will be more resistant to vandalism than wood. Also, stenciled signs can be painted on the bikeway surface.

(12) Safety. Safety should be designed into all bike trails. Inadequate trail width, poor trail maintenance (tree debris and erosion deposits) and inadequately constructed shoulders have been identified as the leading causes of accidents on bike trails.

(13) Support facilities.

(a) Sanitary. Bike trails should be routed near existing public restrooms and trash receptacles should be provided at appropriate locations. Provision of sanitary facilities should be considered along isolated trails or isolated segments of longer trails.

(b) Potable water. Potable water should be provided on longer trails. Well water with 5 gpm supply is sufficient.

(c) Parking area. Many users transport their bicycles from home and will need ample room to park vehicles and unload. Scattering parking and access points to the bikeway will help diffuse cyclists along the entire route. It also enables cyclists to plan trips of varying length and scenic interest. Parking lots should provide for ample circulation of traffic and avoid congestion.

(d) Bike racks. There are many different types of racks and lockers, ranging from standard bar racks to coin and key operated models. Choice of suitable parking equipment must be based on security needs, unit costs, location and the number of anticipated users. Standard designs for bike racks are given in, "Architectural Graphic Standards."

6-3. Riding Trails.

a. Application. Horseback riding trails may be needed in both the urban and rural setting, but usually are more in demand in urban areas. Horseback riding trails are best developed on terrain that is well drained. Fire lanes can often be developed as a dual use trail.

b. Controls. Safety of rider and horse, isolation from other recreation use, (particularly that use where extreme noise could be dangerously distracting to the horse), and demand for facilities control design of riding trails.

c. Design Considerations.

(1) Surface. The natural surface should be used wherever possible. Sand or wood chips may be used in areas of concentrated use. Grade for good transverse drainage to avoid puddling of water. Soils subject to wearing depressions where water could collect should have subdrainage and be reinforced with gravel and finished with sand surfacing.

(2) Drainage. Provide drainage to prevent erosion and excessive wear on trail. On flat terrain subsurface water is often as much of a problem as surface water. Where relocation is not a viable solution, ditching to draw water from the trail area (lower the water table) is a possibility. The need for culverting and bridging of streams should also be considered in the design.

(3) Gradient. Grades in excess of 10 percent are difficult and costly to maintain. If grades in excess of 10 percent (maximum 20 percent) are to be used they should be limited to short sections (less than 100 feet).

(4) Length and alignment. Trails can range from 1 to 20 miles depending upon availability of land, needs of the user, and management capabilities. The alignment should, in general, fit the topography of the area. On flat terrain, the trail should curve and wind to provide diverse experiences. The trails should run through points of scenic, historic or recreational interest. Avoid steep grades, poor drainage areas and conflict with motorized vehicles. The following corridor types are preferred: ridge lines, shorelines of streams and lakes, canals and logging or rural dirt roads.

(5) Width. Width should be 2 to 3 feet minimum and 6 to 8 feet maximum. The larger width will only be needed in dense traffic areas.

(6) Clearance. The horizontal clearance should be 2 feet beyond the sides of the tread. The minimum vertical clearance should be 10 feet.

(7) Maintenance. Segments of the trail susceptible to erosion or bogging have to be checked regularly. Clearing around the tread area is an annual requirement. Maintenance should be considered during the design of the trail.

(8) Signs. Directional signing is needed at trail heads, points of interest, trail crossings, and at areas of unsafe conditions. Mileage markers are desirable on longer trails.

(9) Safety. Care should be taken during the design to relate the difficulty of the trail to the user's experience. Hazards, such as cliffs, ledges, dead timber, and streams should usually be avoided.

(10) Support facilities.

(a) Sanitary. Heavily used trails should have toilet facilities provided, usually adjacent to the trail entrance or parking area. Trash receptacles should not be needed on trails, but should be provided near the entrance and parking area.

(b) Potable water. Potable water in the quantity of 5 gpm should be provided. Provisions must be made for watering horses; stream, pond or lake water can be utilized where available. Generally water should be available at the trails end and beginning.

(c) Parking area. Parking should be provided near the trail's entrance for cars and trailers. Ample space should be allowed for the loading and unloading process.

(d) Hitch racks. Hitch racks should be provided at the trail's start and finish and at most popular stopping points along the trail.

(e) Concessions. Concessions should be provided on an as needed basis.

(f) Loading and unloading ramp. A 30 inch ramp height will meet most users needs. Ramp slope should be no greater than 10 percent.

6-4. Off-Road Vehicles (ORV).

a. Application. Off-road vehicles are in abundant use today. The provision of multipurpose ORV trails has become an important recreation design consideration. Specific areas and facilities are required for the use of off-road vehicles.

b. Controls. Sufficient buffer area is a major consideration in the design of the off-road vehicular recreation area. This is imporant in order to maintain visual and noise separation from other recreation users and adjacent landowners. Access to the area should be limited to one entrance. Safety of participants is of utmost importance. Monitoring use, reducing fire hazards, and controlling dust are also important design considerations.

c. Design Considerations. Before designing off-road vehicle trails, local enthusiasts and experts should be consulted. The people who are going to use the trail should have an input with regard to desired degree of difficulty, support facilities and regulations as well as overall layout and design. In appropriate parts of the country, nearly any kind of trail can serve as a snowmobile trail during the winter months. With motorcycles being the most popular ORV, most of the following standards are for motorcycle trails alone, although many of them could be applied to other types of ORV (See Figure 6-7).

Figure 6-7 Off-road recreation vehicle trail

(1) Drainage. Water bars or diversion ditches should be provided to control runoff water. Low areas should have permanent positive drainage structures. Wet trail surface and the opposite extremely dry, dusty conditions, should be anticipated and drainage and dust control provided accordingly.

(2) Gradient. Variations in the terrain are a major attraction to the ORV users. Slopes up to 45 percent are easily negotiated by an experienced motorcycle operator. The primary contoll for grade is the ability of the soil to tolerate deterioration and erosion cause by the interaction of the elements and the user vehicle.

(3) Length and alignment. Length is not important as even very short trails can be made very challenging and enjoyable for the ORV user. The ORV trail can be 1/2 mile, 3 miles, or longer. For safety, ORV trails should utilize one-way, loop alignment. Some cross-country snowmobile trails may have a linear alignment with two-way traffic which must be wider than 6 feet. Simply mowing or "bushhogging" loops in a grass or weed field can provide the ideal place for younger more inexperienced motorcyclists and minibikers.

(4) Width. Width for motorcycle trails can vary between 1 to 6 feet. As the width is narrowed the rider's challenge is intensified.

(5) Clearance. Motorcycles and snowmobiles require a standard clearance of 6 feet horizontally and 7 feet vertically. Four wheel drive vehicles will require 10 feet horizontal clearance and 9 feet vertical clearance.

(6) Signs. Trail rules, trail layout, and hours of operation should be prominently displayed at the trail entrance. A minimum number of directional signs should be provided along the trail route to maintain the desired flow of traffic. Signs should be low profile and placed to reduce vandalism and to reduce hazards for errant drivers.

(7) Safety. Safety reminders should be posted prominently to guide the users conduct on the trail. Trails should be varied, allowing the user to operate safely at his/her level of skill. Areas for beginners should include more gradual slopes and smoother surfaces. Man-made obstacles at difficult sections of a trail can enhance safety in some cases by forcing riders to operate at slower speeds. Safety equipment, such as; helmets, gloves, pads, leather pants and boots should be mandatory. Additional guidance on ORV safety practices can be obtained from the National Safety Council.

(8) Support facilities.

(a) Sanitary. Heavily used trails should have toilet facilities easily accessible usually adjacent to a trail entrance and/or parking area. Trash receptacles should also be provided near the entrance and parking area.

(b) Potable water. A water well at the parking area yielding 5 gpm is sufficient for water supply.

(c) Parking area. Parking should be provided near the trail's entrance for vehicles and trailers. Space should be allowed for the loading and unloading process. Several smaller parking areas should be considered rather than one large one. Riders should be channeled from the parking area to the trail through a controlled point (usually one entrance).

(d) Camping and picnicking. Camping and picnicking facilities should be considered for ORV trail users.

(e) Loading and unloading ramp. A ramp should be provided where the level of anticipated use is such that the ramp could aid in relieving congestion at the staging area. A height of 24 inches should be used to meet both trailer and truck bed heights.

6-5. Physical Fitness Trails.

a. Application. In urban areas there is a demand for a facility where the people can compress a great amount of physical exercise into a small area and do it in a short amount of time. Actually the need for this type facility is great in rural areas as well. The entire country is becoming "health conscious" and the popularity of these facilities is rapidly increasing.

b. Controls. Physical fitness trails are limited by safety, terrain, climate, and the needs of the user. Input from professionals in physical education as well as medical doctors should be sought in the design of the more elaborate physical fitness trails.

c. Design Considerations.

(1) Surface. The surface can be grass, cinders, 3/8 inch gravel or asphalt, depending on the amount of traffic anticipated and the budget. If gravel is applied, a 2 inch base of 3/4 inch gravel should be topped with at least 2 inches of 3/8 inch gravel and rolled to the desired compaction. Cinders may be applied over 3/4 inch gravel instead of 3/8 inch gravel. For foot traffic only, a 2 inch rock base and a 2 inch asphalt top are sufficient. If trucks or tractors will run over the trail, a 4 inch base should be used under asphalt.

(2) Drainage. The trail should be crowned so water will run off slowly.

(3) Gradient. A level grade is desired for most jogging trails. The use of any grades greater than 2 percent must be given careful consideration. Where space is limited the use of short uphill grades can offset the shortness of a trail and maintain a desired level of difficulty. Figure 6-8 shows a well used physical fitness trail.

(4) Length and alignment. The length of these trails can range from 1/4 mile to 2 miles. Regimented exercise trails should have a single start/finish point with a one-way, loop design. Trails designed only for jogging may be for two-way traffic and have more than one starting point.

(5) Width. Trails, for jogging should be 6 feet wide allowing for 2 people to run side by side and to allow for two-way traffic.

Figure 6-8 Physical fitness trail

(6) Clearance. Physical fitness trails should have a horizontal clearance of 2 feet beyond tread width on both sides and a vertical clearance of 8'.

(7) Signs. The trail should have adequate signs to regulate and inform the using public. Signs should be low profile and compatible with the surrounding landscape. Standard wooden or metal materials can be used but metal types are more resistant to vandalism than wood.

(8) Safety. Handrails should be provided on bridges and steps. Consideration should be given to providing lighting for trails where there is a demand for nighttime use.

(9) Support facilities.

(a) Sanitary. Heavily used trails should be provided with toilet facilities and trash receptacles at trail access points and parking areas.

(b) Potable water. Potable water is especially appreciated on physical fitness trails and should be provided where the volume of use can justify the expense.

6-6. Cross Country Ski Trails.

a. Application. Trails for skiing are in demand where the winter season is especially long and proper conditions prevail.

b. Controls. Ski trails should not be used for other wintertime activities, such as snowmobiling, snowshoeing or tobogganing. These activities compact the snow, crush the skier's groove to an icy sheet, and reduce control and safety for the skier. Weather conditions certainly are the main controlling factor. Ready availability of project land also will be a constraint for long distance trails and ski facility development.

c. Design Considerations.

(1) Surface. The actual ground surface requires very little attention, but to provide optimum conditions for the skiers the surface of the snow itself should be groomed regularly. To maintain optimum surface conditions for the skiers a track setting device should be used after each snowfall. The most economical track setters are volunteer ski tourers who set the track or groove by "breaking trail" or skiing each of the trail routes. A second method of track setting is to pull a track-setting sled over the trail with a snowmobile of 40 hp or more. The snowmobile also compacts the fresh snow. A regular snow tractor of 80 hp or more can pull heavier track-setting sleds capable of making a double set of tracks. Such a tractor is also often used for grooming snowmobile trails.

(2) Drainage. Good drainage design should be provided to prevent erosion of the ground surface during the spring thaw and heavy rains.

(3) Gradient. The trail should be about one-third flat, one-third uphill, and one-third downhill to provide interest and variety. Generally, a 15 degree or less slope is suitable for novices and general use, while short, 40 degree maximum slopes challenge advanced skiers. The trail should start out fairly level for about 100 yards. This gives skiers a chance to get accustomed to snow conditions and apply a different wax to skis, if necessary. If the terrain provides a chance to climb, then the skier can glide downhill on returning. If the terrain drops away, it means a climb back to the parking area, sometimes unwelcomed after several hours on the trail.

(4) Length and alignment. There are no limitations on maximum length. These trails should be no less than 2 miles in length. One hour's activity may be all a skier can tolerate before resting. The well conditioned, advanced skier may travel 6 miles, and the intermediate skier about 3 miles, while the beginning skier may be content with about 1 mile, in an hour's time. Trails should be laid out in connected loops, giving skiers a choice of distance they wish to cover. A system of cloverleaf configurations - mostly for one-way traffic - allows the intermediate and experienced skier to determine the distance that can be traveled in a given time. If possible, avoid placing trails on open, unshaded south or west facing slopes.

(5) Width. The trail should be at least 5 to 6 feet wide, where possible, to permit skiing side by side, as well as snow grooming machines.

(6) Clearance. Because snow buildup elevates the skier and the grooming machines, trees along the trail should be trimmed up to at least 10 feet in height to provide vertical clearance.

(7) Signs. Generally, signs with dark backgrounds and white lettering show up best against the snow. Trail head signs depicting the entire trail system, should be placed at the start of the trail, or near the parking area. This helps the skier become familiar with locations of rest stops, sanitary facilities, warming shelters, and the degree of difficulty of the routes. A code to explain trail difficulty ratings should be on this sign. Direction at junctions help keep the skier on the chosen trail, especially when color-coded or otherwise marked to indicate trail difficulty. Such signs help keep the novice off a trail beyond his or her ability. Signs can also state the distance back to the trail head. General information signs may caution the skier about a steep hill, upcoming bridge, direction of travel, or a bypass around a difficult section.

(8) Safety. Local cross-country ski touring club members should be consulted for safe trail layout. If possible, ski trails should avoid crossing roads, not only because of the potential accident hazard, but also because the road surface can damage the skis.

(9) Support facilities.

(a) Sanitary. Heated restrooms with flushing facilities is preferable, but it is possible to make do with temporary, self-contained comfort stations or properly maintained vault toilets. Trash receptacles should not be needed on trails but should be provided near the entrance and parking area. Signs should be posted at the entrance, stating that no receptacles will be available on the trail and that the skiers should "Pack it in and Pack it out".

(b) Potable water. It is not essential to provide water on shorter trails; however, potable water should always be available, at least at the beginning and end, on longer trails. A hand pumped well yielding 5 gpm is sufficient.

(c) Parking area. A parking area cleared of snow can serve as a staging area for groups of skiers.

(d) Rest stops. Rest stops may consist of maintained primitive windbreaks and fire pits. Trash receptacles could also be provided where the area is accessible to maintenance vehicles.